Outpatient Pleurodesis of Malignant Pleural Effusions Using a Small-Bore Pigtail Catheter*

Louis Saffran, MD; David E. Ost, MD, FCCP; Alan M. Fein, MD, FCCP; and Mark J. Schiff, MD

Study objective: Patients with symptomatic malignant pleural effusion are usually treated with large-bore chest tube placement and pleurodesis requiring ≥ 3 days of hospitalization. We sought to demonstrate the feasibility of ambulatory drainage and sclerosis using a small-bore pigtail catheter in patients with malignant pleural effusions. We reasoned that this approach would improve symptoms and quality of life at a reduced cost.

Methods: A 14F pigtail catheter was percutaneously inserted into the pleural space and connected to a closed gravity-drainage bag system. The patients were instructed in the use of the drainage system and discharged to return for sclerosis with < 100 mL/24 h. Patients were graded for dyspnea and performances status using the Eastern Cooperative Oncology Group score (ECOG) and baseline and transitional dyspnea index score (BDI-TDI) before tube placement and again at 30 days. Radiographic response was graded as total response, partial response, or failure. Telephone follow-up was initiated when the patient could not return for evaluation.

Results: Ten ambulatory women, ages 41 to 79 years, were enrolled. The chest tube was left in place from 1 to 10 days, draining a mean of 2,956 mL (1,685 to 6,050 mL). Only two patients were unable to undergo sclerosis owing to catheter dislodgment and minimal drainage. Six reported symptomatic improvement at 30 days confirmed by TDI and ECOG scores in four of six. One with a prior history of a lobectomy was found to have a chylous pleural effusion and experienced a hydropneumothorax, for which sclerosis was unsuccessful. One died in hospital on day 26 after sclerosis despite radiographic resolution. Of the four patients who had improved dyspnea and functional status by TDI and ECOG scores, radiographic response was complete in three and partial in one. Two of the six were not able to return for follow-up because of weakness but reported improvement by telephone inquiry.

Conclusion: Ambulatory sclerosis of malignant effusion using a small-bore catheter is a feasible alternative to inpatient sclerosis with a large-bore chest tube, especially in patients with strong preferences for outpatient care.

Key words: ambulatory sclerotherapy; malignant pleural effusions; pigtail catheter; sclerosis; talc slurry

Abbreviations: ECOG = Eastern Cooperative Oncology Group; TDI = transitional dyspnea index

Cancer accounts for 40% of all pleural effusions, especially in those > 50 years old.1 In the United States, approximately 100,000 cases of pleural effusions are caused by malignancy. Bronchogenic and breast cancers account for 75% of malignant pleural effusions, with the remaining 25% represented by a cross-section of other neoplastic diseases.2 Approximately two thirds of malignant pleural effusions occur in women because of the strong association of malignant effusions with breast and ovarian cancer.

Most patients with malignant pleural effusion are symptomatic. The most common presenting complaints are shortness of breath, cough, chest pain, and a sense of fullness within the chest. Treatment is directed toward relief of these symptoms. If the malignancy is sensitive to chemotherapy (eg, lymphoma, small cell lung cancer), systemic treatment alone may control the effusion. When the tumor does not respond to chemotherapy, management of...
the effusion includes thoracentesis. If the fluid reaccumulates after repeated thoracentesis, options are chemical pleurodesis via chest tube, thoracoscopy with pleurodesis, open thoracotomy with pleurec-
tomy, or pleuroperitoneal shunting.

Most reported series have studied chemical pleu-
rodesis using a chest tube in hospitalized patients.
Once the drainage decreased to < 100 mL/24 h, a
sclerosing agent was instilled, with ≥ 3 days of
hospitalization commonly required. Intrapleural
chemical agents include tetracycline, doxycycline,
bleomycin, talc insufflation, or talc slurry.

The purpose of this study was to evaluate the
efficacy, safety, and effect on quality of life of
outpatient sclerotherapy using small-bore pigtail cathe-
ters. The pigtail catheter was used to prevent acci-
dental dislodgment. We chose to use talc as a
sclerosant because it has a much higher success rate
compared to inpatient large-bore or surgical pleurodesis. We
might prefer outpatient small-bore catheter scleroses
to inpatient large-bore or surgical pleurodesis. We
report a feasibility study conducted entirely in the
outpatient setting of pleurodesis for malignant pleu-
ral effusions.

**Materials and Methods**

Ten consecutive ambulatory patients with symptomatic malign-
ant pleural effusions, with an Eastern Cooperative Oncology
Group (ECOG) score of ≤ 3 were enrolled. Informed consent
was obtained in all cases.

A predrainage ECOG, baseline dyspnea index, and chest
radiograph were obtained. All patients had recurrent sympto-
matic pleural effusions after initial thoracentesis. Ultrasound guid-
ance was used in two patients with loculated fluid by chest
radiograph. Lidocaine was used for local anesthesia, and a small
incision was made with a scalpel before inserting a 14F pigtail
catheter (van Sonnenberg Chest drain set; Boston Scientific;
Watertown, MA; Fig 1). The trocar method for insertion was
used, and the catheter was locked to prevent it from dislodging,
then connected by tubing (Boston Scientific) to a Dover urine leg
bag (Sherwood Medical; St. Louis, MO) for gravity drainage. All
tubes were secured to the skin with a catheter cuff set (Percu-
fix Catheter Cuff Kit; Boston Scientific). Not > 1 L was drained
before discharging the patient. The patient and their family were
provided with a graduated measuring cylinder, home-care in-
structions, and emergency contact information. Intermittent
closure of the catheter using the shutoff valve was permitted. The
patient recorded the amount of drainage, and this was
reported during the daily telephone interviews. Once the drainage
decreased to < 100 mL/d, the patients were instructed to return for
sclerotherapy.

Sclerotherapy was accomplished by instillation of 50 mL of 1%
lidocaine followed by 4 g of talc slurry and 20 mL of saline
solution flush. The patient was observed for 1 h before discharge.
The tube was clamped for 2 h, after which a shutoff valve was
opened to permit gravity drainage. The catheter was removed the
following day.

**Results**

Ten women were enrolled, ages 41 to 79 years
(mean, 55 years). Primary malignancies were breast
carcinoma (n = 6), breast and ovarian carcinoma
(n = 1), non-small cell lung carcinoma (n = 2), and
leiomyosarcoma (n = 1). Patients 3 and 10 under-
grew drainage despite the effusions appearing locu-
lated because they appeared to be free-flowing single
loculations. The chest tubes remained in place for an
average of 5.7 days (range, 1 to 10 days), draining a
mean of 2,956 mL (range, 450 to 6,050 mL). Figure
2 shows an example of a chest radiograph with a
pigtail catheter in place and a 5-month follow-up
chest radiograph. Ultrasound localization was used in
2 of 10 patients. Baseline fluid characteristics and
cHEST}
follow-up because they were not ambulatory. By telephone inquiry, they reported significant improvement of their dyspnea (Table 2).

Two patients who underwent sclerosis did not have symptomatic improvement, although one had resolution by chest radiograph. The first patient was hospitalized for dysphagia a few days after sclerosis. An effusion on the opposite side was discovered, so she underwent sclerosis in the hospital. After sclerosis, she experienced increasing dyspnea and finally was intubated in the ICU. The patient died 26 days later of respiratory failure. At the time of death, the patient did not have reaccumulation of fluid. The other patient without symptomatic improvement after sclerosis had a history of a lobectomy and was found to have a chylous effusion. She experienced a hydropneumothorax after drainage but underwent sclerosis anyway. Sclerosis proved unsuccessful in this case.

Neither wound infections nor occluded catheters were reported. After sclerosis with talc, pain was not significant.

**DISCUSSION**

The development of malignant pleural effusion frequently heralds a poor prognosis. In addition, recurrent malignant pleural effusions can cause severe debilitating symptoms and impair the quality of life. Current options for palliation of symptomatic effusions include repeated thoracenteses, large-bore (25F to 36F) or small-bore (7F to 16F) chest tube drainage, chemical sclerotherapy, or video-assisted thorascopic drainage and sclerosis. Although repeated thoracentesis can give symptomatic relief, the recurrence rate is reported to be high.10 Inpatient drainage with large-bore chest tubes connected to

---

**Table 1—Patient Characteristics and Pleural Data**

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Sex</th>
<th>Age, yr</th>
<th>Cancer</th>
<th>Cytology</th>
<th>pH</th>
<th>Pleural Glucose, mg/dL</th>
<th>Duration Chest Tube Placement, d</th>
<th>Total Chest Tube Drainage, mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>41</td>
<td>Breast</td>
<td>+</td>
<td>7.3</td>
<td>63</td>
<td>4</td>
<td>1,685</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>57</td>
<td>Breast</td>
<td>NA</td>
<td>7.47</td>
<td>NA</td>
<td>6</td>
<td>6,050</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>49</td>
<td>Leiomyosarcoma</td>
<td>–</td>
<td>7.57</td>
<td>NA</td>
<td>2</td>
<td>450</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>41</td>
<td>Breast</td>
<td>+</td>
<td>7.39</td>
<td>84</td>
<td>5</td>
<td>2,615</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>56</td>
<td>Lung</td>
<td>NA</td>
<td>7.47</td>
<td>83</td>
<td>10</td>
<td>4,035</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>71</td>
<td>Breast</td>
<td>+</td>
<td>7.05</td>
<td>134</td>
<td>3</td>
<td>1,770</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>64</td>
<td>Breast</td>
<td>+</td>
<td>7.36</td>
<td>131</td>
<td>10</td>
<td>4,135</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>59</td>
<td>Breast</td>
<td>+</td>
<td>7.76</td>
<td>208</td>
<td>1</td>
<td>1,150</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>46</td>
<td>Breast</td>
<td>+</td>
<td>7.05</td>
<td>164</td>
<td>8</td>
<td>3,920</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>69</td>
<td>Lung</td>
<td>–</td>
<td>7.14</td>
<td>NA</td>
<td>8</td>
<td>3,755</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>55</td>
<td></td>
<td></td>
<td>7.37</td>
<td>123</td>
<td>5.7</td>
<td>2,956</td>
</tr>
</tbody>
</table>

*NA = not available.
wall suction followed by sclerosis is the most commonly used palliative intervention. However, inpatient chest tube drainage has several drawbacks, including the cost of hospitalization, severely limited mobility, and discomfort. Video-assisted thoracoscopy offers the advantage of visualization of the pleural surface and allows small adhesions to be broken up, thereby allowing apposition of the pleural surfaces. This technique has the highest success rate but also requires hospitalization with local anesthesia supplemented by IV narcotic and neuroleptic agents in most cases. Multicenter studies are underway currently comparing video-assisted thoracoscopy with standard chest tubes for sclerosis of malignant pleural effusions.

Small-bore drainage of malignant effusions was first found to be feasible by Talamonti et al. Satisfactory drainage was obtained in 8 of 12 patients with no demonstrable recurrence of the effusion after a mean follow-up of 8.5 weeks. Since then, a number of articles have reported successful palliation using small-bore chest tube for pleurodesis. Small-bore chest tubes have somewhat lower success rates when compared with conventional chest tubes. The most common complications reported are infection and pneumothorax. The pneumothorax rate is higher when the Seldinger technique is used, as opposed to the trocar method of insertion. The success rate with small-bore chest tubes used on an inpatient basis ranges from 62 to 95%. Difficulties with tube occlusion have been described when using chest tubes smaller than 12F. The length of time the chest tubes have remained in place is similar for both the large-bore chest tubes and the small-bore chest tubes, usually 5 to 6 days.

All but one study, by Walsh et al., used ultrasound or fluoroscopic guidance for placement of the chest tubes. We used ultrasound guidance in the two patients with anterior loculations. There may have been a benefit to fluoroscopy in the patient with the large lung mass; however, it is likely that fluoroscopic evaluation would not have differentiated a mass from an effusion.

Patz et al., in 1996, published the first and only other series of 19 patients with malignant effusions who underwent ambulatory sclerotherapy using small-bore (10.3F) catheter drainage with fluoroscopic guidance. Tubes were in place 2 to 11 days (mean, 5.1 days), and bleomycin was used for sclerosis. Overall, there was a 53% complete and 26% partial success rate, and two tubes became clogged; both tubes easily cleared with a guidewire. One patient had a wound infection and empyema that necessitated hospitalization for 6 days. All patients experienced marked improvement in respiratory symptoms after drainage and sclerosis.

In our study, we demonstrated for only the second time that pleural drainage and sclerotherapy with small-bore tubes can be successfully performed on an outpatient basis. Our study is unique in that radiologic guidance was not used unless the effusion appeared to be loculated, making it more easily performed in an outpatient setting. We also used talc slurry as opposed to tetracycline, doxycycline, or bleomycin as was used in the prior studies. Talc slurry has demonstrated superior results compared with bleomycin and is much less expensive ($50 vs $1,000/dose). In addition, patients do not experience any nausea or vomiting with talc as has been reported previously with bleomycin.

---

**Table 2—Baseline and Follow-up Performance, Dyspnea, and Radiographic Data**

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>ECOG Baseline</th>
<th>BDI</th>
<th>Baseline Chest Radiograph</th>
<th>ECOG Follow-up</th>
<th>TDI</th>
<th>Follow-up Chest Radiograph</th>
<th>Telephone Follow-up†</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>4</td>
<td>Fluid to hilum</td>
<td>NF</td>
<td>NF</td>
<td>NF</td>
<td>Improvement</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>11</td>
<td>Anterior loculation</td>
<td>1</td>
<td>8</td>
<td>Full response</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>5</td>
<td>Anterior loculation</td>
<td>NA</td>
<td>NA</td>
<td>CT revealed a lung mass</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>7</td>
<td>Fluid to hilum</td>
<td>0–1</td>
<td>6Z</td>
<td>Partial response</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>2</td>
<td>Fluid to hilum</td>
<td>NF</td>
<td>NF</td>
<td>NF</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>3</td>
<td>Fluid to hilum</td>
<td>1</td>
<td>3</td>
<td>Full response</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>2</td>
<td>Fluid above hilum</td>
<td>NA</td>
<td>NA</td>
<td>Dead, c 26</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>2</td>
<td>Fluid below hilum</td>
<td>3Z</td>
<td>3Z</td>
<td>Partial response‡</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>5</td>
<td>Fluid to hilum</td>
<td>3Z</td>
<td>3Z</td>
<td>Full response</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>9</td>
<td>Anterior loculation</td>
<td>NA</td>
<td>NA</td>
<td>Hydropneumothorax</td>
<td></td>
</tr>
</tbody>
</table>

*BDI = baseline dyspnea index; NF = not able to follow-up in the office; NA = not applicable; Z = impairment for reasons other than shortness of breath.
†Telephone follow-up for patient who could not have follow-up in the office because of pain.
‡Any positive number indicates improvement.
§Patient had a partial response without sclerosis, only with drainage.
||Decreased ambulation secondary to a new brain lesion.
We demonstrated that outpatient catheter sclero-
sis is feasible in patients with malignant pleural ef-
fusions. Patients reported improved functional sta-
tus without any significant complications or mortal-
ity. Although efficacy was lower than with conven-
tional inpatient chest tube sclerosis, the cost was also
significantly lower. In addition, the patient’s desire to
remain at home could be accommodated. This qual-
ity-of-life issue is important in patients who may have
significant near and intermediate mortality.

### Summary

We demonstrated that outpatient catheter sclero-
sis is feasible in patients with malignant pleural ef-
fusions. Patients reported improved functional sta-
tus without any significant complications or mortal-
ity. Although efficacy was lower than with conven-

### Table 3—Charges Excluding Physician Fee

<table>
<thead>
<tr>
<th>Supplies</th>
<th>Outpatient Pigtail Charges Excluding Physician Fee, $</th>
</tr>
</thead>
<tbody>
<tr>
<td>van Sonnenberg 14F pigtail catheter</td>
<td>97</td>
</tr>
<tr>
<td>Connecting tube</td>
<td>10</td>
</tr>
<tr>
<td>Percutix catheter cuff kit</td>
<td>12</td>
</tr>
<tr>
<td>Urine leg bag</td>
<td>2</td>
</tr>
<tr>
<td>Sterile gloves</td>
<td>3</td>
</tr>
<tr>
<td>Scalpel</td>
<td>9</td>
</tr>
<tr>
<td>Sterile towels × 2</td>
<td>3</td>
</tr>
<tr>
<td>Sterile gown</td>
<td>2.50</td>
</tr>
<tr>
<td>Talc</td>
<td>50</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>50</td>
</tr>
<tr>
<td>Lidocaine, 1% × 2</td>
<td>4</td>
</tr>
<tr>
<td>Chest radiograph</td>
<td>91</td>
</tr>
<tr>
<td>Total</td>
<td>323.50</td>
</tr>
</tbody>
</table>

### References

1. Hauser FH, Yarbro JW. Diagnosis and treatment of malig-
nant pleural effusion. Semin Oncol 1985; 12:54–75
   1222
pleurodesis for malignant pleural effusion: a 10 year re-
6. Oszko M. Pleural effusions: pathophysiology and manage-
7. Zaloznik A, Oswald S, Langin M. Intrapleural tetracycline in the management in malignant pleural effusion: a random-
vs tetracycline for control of malignant effusions: a random-
ized study [abstract]. Proc Am Assoc Cancer Res 1980; C-189:366
12. Hauser FH, Yarbro JW. Diagnosis and treatment of malig-
nant pleural effusion. Semin Oncol 1985; 12:54–75
17. Walsh FW, Albert MW, Solomon DA, et al. Malignant pleural effusion: pleurodesis using a small-bore percutaneous cath-
20. Seaton KG, Patz EF, Goodman PC. Palliative treatment of malignant pleural effusions: value of small-bore catheter tho-
racoscopy and doxycycline sclerotherapy. AJR Am J Roent-
genol 1995; 164:589–591